

We Claim:

1. A scroll-type machine comprising:
 - a first scroll member having an end plate and a first spiral wrap
upstanding therefrom;
 - a second scroll member having an end plate and a second spiral wrap
5 upstanding therefrom, said first and second scroll members being positioned with said
first and second spiral wraps interleaved with each other;
 - a fixed support structure for supporting said first and second scroll
members for relative orbital movement therebetween whereby said first and second
spiral wraps define sealed moving fluid pockets which progressively decrease in size
10 as they move from a radially outer position to a radially inner position;
 - a power source coupled to said first scroll member and operative to effect
said relative orbital movement therebetween between said first and second scroll
members,
 - a device selectively actuatable to effect relative radial movement between
15 said first and second scrolls to thereby form a leakage path between said moving fluid
pockets while said power source continues to operate whereby the capacity of said
compressor is reduced, said device being independent of said coupling of said power
source to said first scroll.
2. A scroll-type machine as set forth in claim 1 wherein said leakage
path is sufficient to reduce the capacity of said scroll machine to substantially zero.
3. A scroll-type machine as set forth in claim 1 wherein said device
operates to reduce the radius of said relative orbital movement.

4. A scroll-type machine as set forth in claim 1 wherein said device is actuated by fluid pressure.

5. A scroll-type machine as set forth in claim 1 wherein said device is actuated in a time pulsed manner between a first position in which said leakage path is formed for a first predetermined time period and a second position in which said moving fluid pockets are sealed from each other for a second predetermined time period.

6. A scroll-type machine as set forth in claim 5 further comprising sensor connected to a control module and operative to provide a signal thereto indicative of operating conditions, said control module being connected to said device and operative to control the duration of said first and second predetermined time periods to thereby modulate the capacity of said machine while maximizing the efficiency thereof for said operating conditions.

7. A scroll-type machine as set forth in claim 1 wherein said device includes a chamber, a piston movably disposed within said chamber, said piston being movable into engagement with said first scroll member to reduce the orbital radius thereof.

8. A scroll-type machine as set forth in claim 7 wherein said device further includes a passage for supplying pressurized fluid to said chamber to effect movement of said piston.

9. A scroll-type machine as set forth in claim 8 wherein said device further includes a valve operative to selectively supply pressurized fluid to said chamber through said passage.

10. A scroll-type machine as set forth in claim 9 wherein said valve is actuated in a time pulsed manner whereby said leakage path is formed for a first predetermined time period and said moving fluid pockets are sealed from each other for a second predetermined time period.

11. A scroll-type machine as set forth in claim 10 further comprising a sensor connected to a control module and operative to provide a signal thereto indicative of operating conditions, said control module being connected to said valve and operative to control the duration of said first and second predetermined time periods to thereby modulate the capacity of said machine while maximizing the efficiency thereof for said operating conditions.

12. A scroll-type machine as set forth in claim 7 wherein said valve is also operative to connect said chamber to an area at substantially suction pressure to thereby vent said chamber and allow movement of said piston out of engagement with said first scroll member.

13. A scroll-type machine as set forth in claim 12 further comprising a spring operative to exert a force on said piston to move said piston out of engagement with said first scroll member.

14. A scroll-type machine as set forth in claim 12 further comprising a second chamber and a passage for placing said second chamber in communication with a supply of pressurized fluid, said pressurized fluid acting on said piston to urge said piston out of engagement with said first scroll member.

15. A scroll-type machine as set forth in claim 1 wherein said machine is a compressor and further comprising a passage opening into at least one of said moving fluid pockets and operative to vent said pocket to a lower pressure area of said machine, a valve for selectively opening and closing said passage
5 whereby the compression ratio of said compressor is reduced when said valve opens said passage.

16. A scroll-type machine as set forth in claim 1 further comprising a motor drivingly connected to said first scroll member and a motor controller operative to vary an operating parameter of said motor in response to a signal from said device indicative of actuation thereof to thereby improve the efficiency of said motor while the
5 capacity of said machine is reduced.

17. A scroll-type machine comprising:

a first scroll member having a first end plate and a first spiral wrap provided thereon;

5 a second scroll member having a second end plate and a second spiral wrap provided thereon, said first and second scroll members being positioned with said first and second spiral wraps interleaved with each other;

a drive shaft drivenly connected to said first scroll member and operative to drive said first scroll member so as to effect relative orbital movement between said first and second scroll members;

10 a bearing housing rotatably supporting said drive shaft and supporting said first and second scroll members for relative orbital movement therebetween, said bearing housing at least in part defining a chamber;

a piston disposed within said chamber and movable between a first position in which the radius of said relative orbital movement has a first magnitude and
15 a second position in which said piston operates to restrict the radius of said relative orbital movement to a magnitude less than said first magnitude to thereby form a leakage path between said moving fluid pockets whereby the capacity of said compressor is reduced.

18. A scroll-type machine as set forth in claim 17 wherein said piston is cycled between said first and second positions in a time pulsed manner whereby said piston is in said first position for a first predetermined time period and in said second position for a second predetermined time period.

19. A scroll-type machine as set forth in claim 18 further comprising a sensor connected to a control module and operative to provide a signal thereto indicative of operating conditions, said control module being operative to control movement of said piston between said first and second positions and to control the
5 duration of said first and second predetermined time periods.

20. A scroll-type machine as set forth in claim 17 wherein said piston is movable into and out of engagement with a surface of said first scroll member.

21. A scroll-type machine as set forth in claim 20 wherein said surface is conical and is formed on a projection provided on the end plate of said first scroll member.

22. A scroll-type machine as set forth in claim 21 wherein said drive shaft includes an eccentric pin and said projection includes a bore into which said eccentric pin projects to drivingly couple said drive shaft to said first scroll member.

23. A scroll-type machine as set forth in claim 22 wherein said piston is positioned in surrounding relationship to said drive shaft and includes a conical surface engageable with said conical surface on said projection when said piston is in said second position.

24. A scroll-type machine as set forth in claim 23 further comprising springs for urging said piston into said first position.

25. A scroll-type machine as set forth in claim 20 further comprising a passage for supplying pressurized fluid to said chamber to move said piston from said first position to said second position and a valve to control flow of said pressurized fluid to said chamber.

26. A scroll-type machine as set forth in claim 25 wherein said valve includes a passage connected in fluid communication with the discharge from said compressor and a second passage connected in fluid communication with a suction inlet of said compressor.

27. A scroll-type machine as set forth in claim 20 wherein said surface is provided on the periphery of said first end plate.

28. A scroll-type machine as set forth in claim 27 wherein said piston includes a first diameter portion positioned in juxtaposed position to said surface when said piston is in a first position and a second larger diameter portion positioned in juxtaposed relationship to said surface when said pin is in said second position.

29. A scroll-type machine as set forth in claim 28 further comprising a plurality of said chambers positioned in circumferentially spaced relationship and a substantially identical piston movably disposed in each of said chambers, said surface being continuously engageable with at least two of said pistons when said pistons are
5 in said second position.

30. A scroll-type machine as set forth in claim 20 wherein said surface is in the form of an opening in said first end plate.

31. A scroll-type machine as set forth in claim 30 further comprising a second chamber spaced from said first chamber, a second piston movably disposed within said second chamber and engageable with the periphery of a second opening provided in said first end plate.

32. A scroll-type compressor comprising:

a hermetic shell;

5 a bearing housing supported within said shell;

a first scroll member movably supported on said bearing housing, said first scroll member including a first end plate and a first spiral wrap provided on one side thereof;

10 a second scroll member supported on said bearing housing, said second scroll member including a second end plate and a second spiral wrap provided on one side thereof;

a drive shaft rotatably supported by said bearing housing, said drive shaft including an eccentric,

15 a radially compliant coupling for drivenly connecting said drive shaft to said first scroll member whereby rotation of said drive shaft operates to orbit said first scroll member with respect to said second scroll member at a first orbiting radius with said first and second spiral wraps being intermeshed and defining moving fluid pockets therebetween which decrease in size as they move from a radially outer position to a radially inward position,

20 a plurality of chambers provided in spaced relationship in said bearing housing,

substantially interleaved pin members movably disposed in each of said chambers, said pin members being movable from a first position at which said first scroll member orbits at said first orbiting radius and a second position in which said pin members restrict the orbiting radius of said first scroll member to a magnitude less than said first radius whereby leakage paths are formed between said moving fluid pockets, and

a drive system for reciprocating said pins between said first and second
30 positions in a time pulsed manner to thereby modulate the capacity of said
compressor.

33. A scroll-type compressor as set forth in claim 32 wherein each of
said pin members extends through an opening in said first end plate.

34. A scroll-type compressor as set forth in claim 32 wherein said
drive system includes a fluid passage for selectively connecting said chamber to
compressed fluid being discharged from said compressor to drive said pin members
from said first position to said second position.

35. A scroll-type compressor as set forth in claim 34 wherein each of
said chambers includes a vent passage to vent said discharge pressure fluid into said
shell.

36. A scroll-type compressor as set forth in claim 34 wherein said
drive system includes a valve for controlling fluid flow through said passage, said
valve also being operative to place said chamber in fluid communication with a suction
inlet of said compressor.